

# Cryogenics

## Index to Volume 40 (2000)

No. 1 (January) pp 1-73  
No. 2 (February) pp 75-153  
No. 3 (March) pp 155-239

Nos. 4-5 (April-May) pp 241-351  
No. 6 (June) pp 353-423  
No. 7 (July) pp 425-497

Nos. 8-10 (August-October) pp 499-679  
No. 11 (November) pp 681-753  
No. 12 (December) pp 755-821

## Article Index (titles in italics refer to Research and technical notes)

### Number 1/January

Theoretical investigations on simultaneous operation of vapour compression refrigeration cycle and Stirling cycle in miniature Stirling cooler with two-component two-phase mixture  
*S.L. Bapat* 1

Thermal quench study in HTSC pancake coil  
*V.S. Vysotsky, Yu.A. Ilyin, T. Kiss, M. Inoue, M. Takeo, F. Irie, H. Okamoto, M. Kanazawa, K. Ohya, S. Hayashida and A.L. Rakhmanov* 9

Universal scaling law for quench development in HTSC devices  
*A.L. Rakhmanov, V.S. Vysotsky, Yu.A. Ilyin, T. Kiss and M. Takeo* 19

Dynamic response of Ag-Bi2223 tapes in applied fields by electric transport measurement  
*Y.H. Zhang, S.Y. Ding, H. Luo, X.F. Wu, P. Zhang, F.Y. Lin, L. Qiu, Z. Xu and X.X. Yao* 29

A large experimental apparatus for measuring thermal conductance of LH2 storage tank insulations  
*S. Kamiya, K. Onishi, E. Kawagoe and K. Nishigaki* 35

Evolution of the ohmic voltage drop in connections of superconductors under time-varying current  
*R. Musenich, S. Farinon, C. Priano and P. Fabbriatore* 45

Design analysis of a cryostable sector magnet for superconducting separated-sector cyclotron  
*J.-W. Kim* 53

Cryogenic contamination of an ultra-low loss mirror for cryogenic laser interferometric gravitational wave detector  
*S. Miyoki, T. Uchiyama, T. Tomaru, D. Tatsumi, H. Ishizuka, M. Ohashi, K. Kuroda, A. Ueda, T. Suzuki, N. Sato, T. Haruyama, A. Yamamoto and T. Shintomi* 61

Generation of liquid helium temperatures using a lead regenerator in a GM precooled pulse tube stage  
*A. von Schneidmeyer, G. Thummes and C. Heiden* 67

### Number 2/February

Study on a new type of sealing - regeneration-labyrinth sealing for displacer in cryocoolers: Part I - Theoretical study  
*L.Q. Liu and L. Zhang* 75

Study on a new type of sealing - regeneration-labyrinth sealing for displacer in cryocoolers: Part II - Experimental study  
*L.Q. Liu and L. Zhang* 85

Design, construction, and performance of plastic heat exchangers for sub-Kelvin use  
*A.B. Patel and J.G. Brisson* 91

Steady state analysis of non-uniform current distributions in cable-in-conduit conductors and comparison with experimental data  
*N. Mitchell* 99

Creep deformation of austenitic steels at medium and low temperatures  
*S. Usami and T. Mori* 117

He II heat transfer through superconducting cables electrical insulation  
*B. Baudouy, M.X. François, F.-P. Juster and C. Meuris* 127

Calorimetric ac-loss measurement of high  $T_c$ -tapes at 77 K, a new measuring technique  
*C. Schmidt* 137

Low temperature thermal conductivity of Kapton and Upilex  
*M. Barucci, E. Gottardi, I. Peroni and G. Ventura* 145

Automated thermoelectric power measurement from 300 to 15 K with a closed cycle refrigerator  
*R. Nirmala, V. Sankaranarayanan, M.G. Sankar and K. Sethupathi* 149

### Number 3/March

Influence of specimen size on the tension-tension fatigue behaviour of fibre-reinforced plastics at room temperature and at 77 K  
*P. Rosenkranz, K. Humer and H.W. Weber* 155

Effect of gap flow on shuttle heat transfer

## Index

- H.-M. Chang, D.-J. Park and S. Jeong* 159
- Partial discharge inception characteristics of  $\text{LN}_2$ /epoxy composite insulation system under thermal bubble condition  
*N. Hayakawa, H. Maeda, S. Chigusa and H. Okubo* 167
- Thermomechanical subdivision of internal energy of some noble gases on the "ideal gas line"  
*S.A. Ulybin, V.I. Sukhov and B.D. Krakovsky* 173
- M&M: Multi-conductor Mithrandir code for the simulation of thermal-hydraulic transients in superconducting magnets  
*L. Savoldi and R. Zanino* 179
- A simplified model for pulse tube refrigeration  
*P. Neveu and C. Babo* 191
- The thermal conductivity of Kapton HN between 0.5 and 5 K  
*J. Lawrence, A.B. Patel and J.G. Brisson* 203
- High-temperature superconducting current lead incorporating operation in the current-sharing mode  
*Y. Iwasa and H. Lee* 209
- The application of the Deiters equation of state to the calculations of the vapour-liquid phase equilibria in systems containing halogenhydrocarbons  
*B. Dąbrowska* 221
- Study on miniature pulse tube cryocooler for space application  
*J. Liang, Y. Zhou, W. Zhu, W. Sun, J. Yang and S. Li* 229
- Behavior of carbon ceramic TVO temperature sensors at static magnetic fields up to 15 T  
*M. Süßer and F. Wüchner* 235
- Number 4-5/April-May**
- Transient temperature measurement of noisy film boiling and silent film boiling in He II  
*P. Zhang, M. Murakami and R.Z. Wang* 241
- Effective thermal conductivity in HTS coils  
*J. Lehtonen, R. Mikkonen and J. Paasi* 245
- Effect of welding structure and  $\delta$ -ferrite on fatigue properties for TIG welded austenitic stainless steels at cryogenic temperatures  
*T. Yuri, T. Ogata, M. Saito and Y. Hirayama* 251
- Thermodynamic performance prediction of pulse tube refrigeration with mixture fluids  
*G. Chen, Z. Gan, G. Thummes and C. Heiden* 261
- Design optimization of a 0.1-ton/day active magnetic regenerative hydrogen liquefier  
*L. Zhang, S.A. Sherif, A.J. DeGloria, C.B. Zimm and T.N. Vezir-oglu* 269
- Metrological systems for monitoring two-phase cryogenic flows  
*Yu.P. Filippov, A.M. Kovrizhnykh, V.M. Miklayev and A.K. Sukhanova* 279
- A study on the relation between the strain scaling law and the temperature scaling law on flux pinning in  $\text{Nb}_3\text{Sn}$  superconducting wires  
*T. Kuroda, K. Itoh, H. Wada and K. Togano* 287
- Dielectric strength, swelling and weight loss of the ITER Toroidal Field Model Coil insulation after low temperature reactor irradiation  
*K. Humer, H.W. Weber, R. Hastik, H. Hauser and H. Gerstenberg* 295
- Influence of longitudinal magnetic field on current distribution and AC loss in twisted multi-filamentary high  $T_c$  superconducting tapes  
*N. Amemiya* 303
- The possibility of SQUID sensitivity enhancement by the use of ferromagnetic antennae  
*S.I. Bondarenko, A.A. Shablo and P.P. Pavlov* 313
- Properties of Ag-Mg alloy sheathed Bi-2223 tapes  
*M.H. Apperley, R. Zeng, F. Darmann and G. McCaughey* 319
- Feasibility study on superconducting fault current limiting transformer (SFCLT)  
*N. Hayakawa, S. Chigusa, N. Kashima, S. Nagaya and H. Okubo* 325
- Experimental study on pulse tube refrigeration with helium and nitrogen mixtures  
*Z.H. Gan, G.B. Chen, G. Thummes and C. Heiden* 333
- Characterisation of the photodetector and light emitting diode at above liquid nitrogen temperature  
*N.B. Manik, A.N. Basu and S.C. Mukherjee* 341
- New  $\text{Nb}_3\text{Al}$ -based A15 multifilamentary wires with high  $J_c$  in high fields  
*Y. Iijima, A. Kikuchi and K. Inoue* 345
- Number 6/June**
- Elementary study on superconducting electromagnetic ships with helical insulation wall  
*K. Nishigaki, C. Sha, M. Takeda, Y. Peng, K. Zhou, A. Yang, D. Suyama, Q.J. Qing, L. Yan, T. Kiyoshi and H. Wada* 353
- Development of perspective cryogenic surgical apparatus  
*V.N. Pavlov* 361
- Molar volume of pure liquid  $^4\text{He}$ : dependence on temperature (50–1000 mK) and pressure (0–1.57 MPa)  
*E. Tanaka, K. Hatakeyama, S. Noma and T. Satoh* 365
- Two-dimensional model for tapered pulse tubes. Part 1: theoretical modeling and net enthalpy flow  
*S.H. Baek, E.S. Jeong and S. Jeong* 379
- Two-dimensional model for tapered pulse tubes. Part 2: Mass streaming and streaming-driven enthalpy flow loss  
*S.H. Baek, E.S. Jeong and S. Jeong* 387
- Two-dimensional quench simulation of composite  $\text{CuNb}/\text{Nb}_3\text{Sn}$  conductors  
*T. Murakami, S. Murase, S. Shimamoto, S. Awaji and K. Watanabe* 393
- Configuration effect of superfluid helium channel on the  $\lambda$ -transition heat flux  
*T. Okamura, M. Takahashi, D. Muramatsu and H. Kobayashi* 403
- Theoretical solution for the cool-down or warm-up process of a pipeline or a packed bed  
*A. Hofmann* 407
- Behavior of CERNOX temperature sensors at static magnetic fields up to 15 T  
*M. Süßer and F. Wüchner* 413

Acoustic quality factor of titanium from 50 mK to 300 K  
W. Duffy Jr. 417

#### Book review

Flow measurement handbook: Industrial designs, operating principles, performance and applications; by Roger C. Baker and M. Süßer 421

#### Number 7/July

A simple calorimeter for fast adiabatic heat capacity measurements from 15 to 300 K based on closed cycle cryocooler

I. Catarino and G. Bonfait 425

Heat transfer correlations for multi-layer insulation systems

C.K. Krishnaprakas, K.B. Narayana and P. Dutta 431

Design and performance of an immersable low-temperature pressure gauge

M. Barucci, E. Gottardi, I. Peroni and G. Ventura 437

Simple fix-point device for temperature scale definition below 1 K

E. Gažo, L. Lokner, R. Scheibel, P. Skyba and N. Smolka 441

Compatibility of two basic models describing the a.c. loss and eddy currents in flat superconducting cables

A.A. Akhmetov 445

Multistage pulse tubes

A.T.A.M. de Waele, I.A. Tanaeva and Y.L. Ju 459

Thermal expansion and thermal conductivity of glass-fibre reinforced nylon at low temperature

M. Barucci, G. Bianchini, T.D. Rosso, E. Gottardi, I. Peroni and G. Ventura 465

Performance evaluation of counter flow heat exchangers considering the effect of heat in leak and longitudinal conduction for low-temperature applications

P. Gupta and M.D. Atrey 469

Study on a pulse tube cryocooler using gas mixture as its working fluid

C.M. Gao, Y.L. He and Z.Q. Chen 475

Development of a laboratory model of activated charcoal-nitrogen adsorption cryocooler

M.J. Prakash, M. Prasad, S.C. Rastogi, B.S. Akkimaradi, P.P. Gupta, H. Narayanamurthy and K. Srinivasan 481

Low temperature thermal conductivity of Kevlar

G. Ventura, M. Barucci, E. Gottardi and I. Peroni 489

Summary - Fourth European Workshop on Low Temperature Electronics

R. Kirschman 493

#### Number 8-10/August-October

Preface: CHATS-Y2K

M. Spadoni 499

Heat front propagation and quench initiation analysis of the ITER toroidal field model coil

C. Marinucci and G. Vécsey 501

Quench simulation of a CICC model coil subjected to longitudinal and transverse field pulses

S. Prestemon, S. Sayre, C. Luongo and J. Miller 511

Quench simulations for superconducting elements in the LHC accelerator

F. Sonnemann and R. Schmidt 519

HT-7U TF and PF conductor design

P.D. Weng, Y.F. Bi, Z.M. Chen, B.Z. Li and J. Fang 531

Predictive study of current sharing temperature test in the Toroidal Field Model Coil without LCT coil using the M&M code

L. Savoldi and R. Zanino 539

Correlation between quench pressure and normal zone voltage observed in the QUELL experiment

A. Anghel, S. Pourrahimi, Y. Takahashi and G. Vécsey 549

Comparison between the predictions of the thermo-hydraulic code Gandalf and the results of a long length instrumented CICC module experiment

P. Bellucci, M. Ciotti, P. Gislou, M. Spadoni, L. Bottura, L. Muzzi and S. Turtù 555

Test results from the Wendelstein 7-X stellarator demonstration coil

R. Heller, W. Maurer, J. Sapper, F. Schauer, I. Schönewolf, A. Ulbricht, F. Wüchner and G. Zahn 561

Calculations of pressure drop and mass flow distribution in the toroidal field model coil of the ITER project

S. Nicollet, J.L. Duchateau, H. Fil-lunger and A. Martinez 569

Methods for the evaluation of quench temperature profiles and their application for LHC superconducting short dipole magnets

S. Sanfilippo and A. Siemko 577

Modelling of helium-mediated quench propagation in the LHC prototype test string-1

M. Chorowski, P. Grzegory, L. Serio and R. van Weelderden 585

Thermal-hydraulic analysis of  $T_{cs}$  measurement in conductor 1A of the ITER Central Solenoid Model Coil using the M&M code

L. Savoldi and R. Zanino 593

Analysis of slow temperature and current ramps on the central solenoid insert coil

N. Mitchell 605

A general model for thermal, hydraulic and electric analysis of superconducting cables

L. Bottura, C. Rosso and M. Breschi 617

A theoretical investigation on current imbalance in flat two-layer superconducting cables

A. Akhmetov, L. Bottura, M. Breschi and P.L. Ribani 627

Modelling of non-uniform current diffusion coupled with thermohydraulic effects in superconducting cables

N. Mitchell 637

Normal zone propagation process accompanied by current redistribution in superconducting triplex cables

N. Amemiya, H. Yonekawa, T. Ogi-tsu, K. Sasaki, N. Ohuchi, K. Tsuchiya and T. Shintomi 655

Experimental results of current distribution in Rutherford-type LHC cables

A.P. Verweij and L. Buchsbaum 663

Macroscopic electrodynamic modelling of superconductors

G. Rubinacci, A. Tamburrino, S. Ventre and F. Villone 671

Proposal for a database for the validation of simulations in superconducting cables

C. Marinucci, L. Bottura, C. Luongo and G. Vécsey 677

## Index

### Number 11/November

The effect of temperature on  $J_c$  and  $n$ -value of Bi(2223) tapes

Z. Wang, Z. Chen, Y. Zhou, Z. Duan and W. Wang 681

A three-stage helium sorption refrigerator for cooling of infrared detectors to 280 mK

R.S. Bhatia, S.T. Chase, S.F. Edgington, J. Glenn, W.C. Jones, A.E. Lange, B. Maffei, A.K. Mainzer, P.D. Mauskopf, B.J. Philhour and B.K. Rownd 685

Effect of microstructure evolution on fracture toughness in isothermally aged austenitic stainless steels for cryogenic applications

M.L. Saucedo-Muñoz, Y. Watanabe, T. Shoji and H. Takahashi 693

Optimization of the orifice pulse tube

P.C.T. de Boer 701

Pool boiling heat transfer characteristics of liquid  $^3\text{He}$  below 1 K

M. Maeda, A. Beppu, Y. Fujii and T. Shigi 713

Flow characteristics of a metering valve in a pulse tube refrigerator

G. Lu and P. Cheng 721

Analysis of current distribution in a large superconductor

T. Hamajima, A.K.M. Alamgir, N. Harada, M. Tsuda, M. Ono and H. Takano 729

Thermal test of the insulation structure for  $\text{LH}_2$  tank by using the large experimental apparatus

S. Kamiya, K. Onishi, N. Konshima and K. Nishigaki 737

Thermal conductivity of polycrystalline and amorphous Se-Te-Cu system

R. Wawryk, Cz. Marucha, K. Balcerak, B.M. Terzijska and Z.G. Ivanova 749

### Number 12/December

Properties of modified anhydride hardener and its cured resin

C. Qiang, G. Bingjun, C. Jinglin and X. Tongzhao 755

Calibration of saturated liquid helium weir flowmeter at Fermilab

M.W. McGee, D.M. France and R.C. Sanders 759

Development of a thermal switch for faster cool-down by two-stage cryocooler

H.-M. Chang and H.-J. Kim 769

A parametric study on the cooling characteristics of an infrared detector cryochamber

H.-Y. Kim, B.H. Kang and D.-Y. Lee 779

Residual strength of aluminum-lithium alloy center surface crack tension specimens at cryogenic temperatures

P.K.G. Potti, B.N. Rao and V.K. Srivastava 789

Cryogenics in space: a review of the missions and of the technologies

B. Collaudin and N. Rando 797

Construction and tests of a heart scanner based on superconducting sensors cooled by small stirling cryocoolers

A.P. Rijpma, C.J.H.A. Blom, A.P. Balena, E. de Vries, H.J. Holland, H.J.M. ter Brake and H. Rogalla 821

## Author Index

- Akhmetov, A., 627  
 Akhmetov, A.A., 445  
 Akkimaradi, B.S., 481  
 Alamgir, A.K.M., 729  
 Amemiya, N., 303, 655  
 Anghel, A., 549  
 Apperley, M.H., 319  
 Atrey, M.D., 469  
 Awaji, S., 393  
  
 Babo, C., 191  
 Baek, S.H., 379, 387  
 Baker, Roger C., 421  
 Balcerek, K., 749  
 Balena, A.P., 821  
 Bapat, S.L., 1  
 Barucci, M., 145, 437, 465, 489  
 Basu, A.N., 341  
 Baudouy, B., 127  
 Bellucci, P., 555  
 Beppu, A., 713  
 Bhatia, R.S., 685  
 Bi, Y.F., 531  
 Bianchini, G., 465  
 Bingjun, G., 755  
 Blom, C.J.H.A., 821  
 Bondarenko, S.I., 313  
 Bonfait, G., 425  
 Bottura, L., 555, 617, 627, 677  
 Breschi, M., 617, 627  
 Brisson, J.G., 91, 203  
 Buchsbaum, L., 663  
  
 Catarino, I., 425  
 Chang, H.-M., 159, 769  
 Chase, S.T., 685  
 Chen, G., 261  
 Chen, G.B., 333  
 Chen, Z., 681  
 Chen, Z.M., 531  
 Chen, Z.Q., 475  
 Cheng, P., 721  
 Chigusa, S., 167, 325  
 Chorowski, M., 585  
 Ciotti, M., 555  
 Collaudin, B., 797  
  
 Dąbrowska, B., 221  
 Darmann, F., 319  
 de Boer, P.C.T., 701  
 de Vries, E., 821  
 de Waele, A.T.A.M., 459  
  
 DeGregoria, A.J., 269  
 Ding, S.Y., 29  
 Duan, Z., 681  
 Duchateau, J.L., 569  
 Duffy Jr., W., 417  
 Dutta, P., 431  
  
 Edgington, S.F., 685  
  
 Fabbricatore, P., 45  
 Fang, J., 531  
 Farinon, S., 45  
 Filippov, Yu.P., 279  
 Fillunger, H., 569  
 France, D.M., 759  
 François, M.X., 127  
 Fujii, Y., 713  
  
 Gan, Z., 261  
 Gan, Z.H., 333  
 Gažo, E., 441  
 Gao, C.M., 475  
 Gerstenberg, H., 295  
 Gislón, P., 555  
 Glenn, J., 685  
 Gottardi, E., 145, 437, 465, 489  
 Grzegory, P., 585  
 Gupta, P., 469  
 Gupta, P.P., 481  
  
 Hamajima, T., 729  
 Harada, N., 729  
 Haruyama, T., 61  
 Hastik, R., 295  
 Hatakeyama, K., 365  
 Hauser, H., 295  
 Hayakawa, N., 167, 325  
 Hayashida, S., 9  
 He, Y.L., 475  
 Heiden, C., 67, 261, 333  
 Heller, R., 561  
 Hirayama, Y., 251  
 Hofmann, A., 407  
 Holland, H.J., 821  
 Humer, K., 155, 295  
  
 Iijima, Y., 345  
 Ilyin, Yu.A., 9, 19  
 Inoue, K., 345  
 Inoue, M., 9  
 Irie, F., 9  
 Ishizuka, H., 61  
  
 Itoh, K., 287  
 Ivanova, Z.G., 749  
 Iwasa, Y., 209  
  
 Jeong, E.S., 379, 387  
 Jeong, S., 159, 379, 387  
 Jinglin, C., 755  
 Jones, W.C., 685  
 Ju, Y.L., 459  
 Juster, F.-P., 127  
  
 Kamiya, S., 35, 737  
 Kanazawa, M., 9  
 Kang, B.H., 779  
 Kashima, N., 325  
 Kawagoe, E., 35  
 Kikuchi, A., 345  
 Kim, H.-J., 769  
 Kim, H.-Y., 779  
 Kim, J.-W., 53  
 Kirschman, R., 493  
 Kiss, T., 9, 19  
 Kiyoshi, T., 353  
 Kobayashi, H., 403  
 Konshima, N., 737  
 Kovrizhnykh, A.M., 279  
 Krakovsky, B.D., 173  
 Krishnaprakas, C.K., 431  
 Kuroda, K., 61  
 Kuroda, T., 287  
  
 Lange, A.E., 685  
 Lawrence, J., 203  
 Lee, D.-Y., 779  
 Lee, H., 209  
 Lehtonen, J., 245  
 Li, B.Z., 531  
 Li, S., 229  
 Liang, J., 229  
 Lin, F.Y., 29  
 Liu, L.Q., 75, 85  
 Lokner, L., 441  
 Lu, G., 721  
 Luo, H., 29  
 Luongo, C., 511, 677  
  
 Maeda, H., 167  
 Maeda, M., 713  
 Maffei, B., 685  
 Mainzer, A.K., 685  
 Manik, N.B., 341  
 Marinucci, C., 501, 677

# Index

- Martinez, A., 569  
 Marucha, Cz., 749  
 Maurer, W., 561  
 Mauskopf, P.D., 685  
 McCaughey, G., 319  
 McGee, M.W., 759  
 Meuris, C., 127  
 Mikkonen, R., 245  
 Miklayev, V.M., 279  
 Miller, J., 511  
 Mitchell, N., 99, 605, 637  
 Miyoki, S., 61  
 Mori, T., 117  
 Mukherjee, S.C., 341  
 Murakami, M., 241  
 Murakami, T., 393  
 Muramatsu, D., 403  
 Murase, S., 393  
 Musenich, R., 45  
 Muzzi, L., 555  
  
 Nagaya, S., 325  
 Narayana, K.B., 431  
 Narayanamurthy, H., 481  
 Neveu, P., 191  
 Nicolle, S., 569  
 Nirmala, R., 149  
 Nishigaki, K., 35, 353, 737  
 Noma, S., 365  
  
 Ogata, T., 251  
 Ogitsu, T., 655  
 Ohashi, M., 61  
 Ohuchi, N., 655  
 Ohya, K., 9  
 Okamoto, H., 9  
 Okamura, T., 403  
 Okubo, H., 167, 325  
 Onishi, K., 35, 737  
 Ono, M., 729  
  
 Paasi, J., 245  
 Park, D.-J., 159  
 Patel, A.B., 91, 203  
 Pavlov, P.P., 313  
 Pavlov, V.N., 361  
 Peng, Y., 353  
 Peroni, I., 145, 437, 465, 489  
 Philhour, B.J., 685  
 Potti, P.K.G., 789  
 Pourrahimi, S., 549  
 Prakash, M.J., 481  
 Prasad, M., 481  
 Prestemon, S., 511  
 Priano, C., 45  
  
 Qiang, C., 755  
 Qing, Q.J., 353  
 Qiu, L., 29  
  
 Rakhmanov, A.L., 9, 19  
 Rando, N., 797  
 Rao, B.N., 789  
 Rastogi, S.C., 481  
 Ribani, P.L., 627  
 Rijpma, A.P., 821  
 Rogalla, H., 821  
 Rosenkranz, P., 155  
 Rosso, C., 617  
 Rosso, T.D., 465  
 Rownd, B.K., 685  
 Rubinacci, G., 671  
  
 Saito, M., 251  
 Sanders, R.C., 759  
 Sanfilippo, S., 577  
 Sankar, M.G., 149  
 Sankaranarayanan, V., 149  
 Sapper, J., 561  
 Sasaki, K., 655  
 Sato, N., 61  
 Satoh, T., 365  
 Saucedo-Muñoz, M.L., 693  
 Savoldi, L., 179, 539, 593  
 Sayre, S., 511  
 Schauer, F., 561  
 Scheibel, R., 441  
 Schmidt, C., 137  
 Schmidt, R., 519  
 Schönewolf, I., 561  
 Serio, L., 585  
 Sethupathi, K., 149  
 Sha, C., 353  
 Shablo, A.A., 313  
 Sherif, S.A., 269  
 Shigi, T., 713  
 Shimamoto, S., 393  
 Shintomi, T., 61, 655  
 Shoji, T., 693  
 Siemko, A., 577  
 Skyba, P., 441  
 Smolka, N., 441  
 Sonnemann, F., 519  
 Spadoni, M., 499, 555  
 Srinivasan, K., 481  
 Srivastava, V.K., 789  
 Süßer, M., 235, 413, 421  
 Sukhanova, A.K., 279  
 Sukhov, V.I., 173  
 Sun, W., 229  
  
 Suyama, D., 353  
 Suzuki, T., 61  
  
 Takahashi, H., 693  
 Takahashi, M., 403  
 Takahashi, Y., 549  
 Takano, H., 729  
 Takeda, M., 353  
 Takeo, M., 9, 19  
 Tamburrino, A., 671  
 Tanaeva, I.A., 459  
 Tanaka, E., 365  
 Tatsumi, D., 61  
 ter Brake, H.J.M., 821  
 Terzijska, B.M., 749  
 Thummes, G., 67, 261, 333  
 Togano, K., 287  
 Tomaru, T., 61  
 Tongzhao, X., 755  
 Tsuchiya, K., 655  
 Tsuda, M., 729  
 Turtù, S., 555  
  
 Uchiyama, T., 61  
 Ueda, A., 61  
 Ulbricht, A., 561  
 Ulybin, S.A., 173  
 Usami, S., 117  
  
 van Weelderen, R., 585  
 Vécsey, G., 501, 677  
 Vecsey, G., 549  
 Ventre, S., 671  
 Ventura, G., 145, 437, 465, 489  
 Verweij, A.P., 663  
 Veziroglu, T.N., 269  
 Villone, F., 671  
 von Schneidmesser, A., 67  
 Vysotsky, V.S., 9, 19  
  
 Wada, H., 287, 353  
 Wang, R.Z., 241  
 Wang, W., 681  
 Wang, Z., 681  
 Watanabe, K., 393  
 Watanabe, Y., 693  
 Wawryk, R., 749  
 Weber, H.W., 155, 295  
 Weng, P.D., 531  
 Wu, X.F., 29  
 Wüchner, F., 235, 413, 561  
  
 Xu, Z., 29

Yamamoto, A., 61  
Yan, L., 353  
Yang, A., 353  
Yang, J., 229  
Yao, X.X., 29  
Yonekawa, H., 655  
Yuri, T., 251

Zahn, G., 561  
Zanino, R., 179, 539, 593  
Zeng, R., 319  
Zhang, L., 75, 85, 269  
Zhang, P., 29, 241  
Zhang, Y.H., 29  
Zhou, K., 353

Zhou, Y., 229, 681  
Zhu, W., 229  
Zimm, C.B., 269

## Keyword

- a.c. loss, 445  
 AC losses (C), 53, 511  
 AC losses, 303, 519, 531  
 Accelerator magnets, 127  
 Accelerator magnets (F), 53, 627  
 AC-losses at 77 K, 137  
 Adsorption pumping, 481  
 Ag-Bi2223 tapes, 29  
 Aluminum-lithium alloys, 789  
 Applied superconductivity, 353  
 Austenitic stainless steels, 693
- Bi(2,2,2,3) tapes, 681  
 Brayton cycle, 261  
 BSCCO-2223/Ag tape, 209
- Cable-in-conduit conductors, 179, 501, 539, 561, 569, 593, 729  
 Cable in conduit conductors (A), 511  
 Calorimeter, 425  
 Calorimetric measuring technique, 137  
 Chalcogenide alloys, 749  
 Coaxial multilayer conductors, 729  
 Composites, 245  
 Composite CuNb/Nb<sub>3</sub>Sn conductor, 393  
 Cool-down, 407  
 Cool-down time, 779  
 Cooling load, 779  
 Counter flow, 469  
 Critical current, 29  
 Critical current density, 287, 681  
 Critical current parameter  $n$ , 29  
 Cryobiology, 361  
 Cryochamber, 779  
 Cryocooler, 75, 481, 701, 821  
 Cryocoolers, 67  
 Cryogen free magnet, 769  
 Cryogenic, 693  
 Cryogenics, 191, 235, 413, 431, 475, 797  
 Cryogenic contamination, 61  
 Cryogenic temperatures, 155, 251  
 Cryostats (F), 685  
 Cryosurgery, 361
- Cu or Ge addition, 345  
 Current lead, 209  
 Current sharing (C), 617  
 Current sharing, 637, 655, 663
- Detectors, 797  
 Diffusion, 45
- Effectiveness, 469  
 Elastic stress intensity factor, 789  
 Electrical insulation, 127, 167  
 Electrical properties, 295  
 Electromagnetic phenomena, 303, 637, 729  
 Electromagnetic phenomena (C), 617, 627, 671  
 Electro-magnetic transients program, 325  
 Energy balance equation, 173  
 Epoxy resin, 167  
 Expander, 159
- Fatigue properties, 155, 251  
 Fault current limiters, 325  
 $\delta$ -ferrite, 251  
 Ferromagnetic antenna, 313  
 Fibre-reinforced plastics, 155  
 Finesse, 61  
 Fix-point device, 441  
 Flow characteristics, 721  
 Fluid dynamics, 159  
 Flux pinning and creep, 287  
 Forced flow, 561, 569  
 Fracture toughness, 693  
 Fusion magnet, 555  
 Fusion magnets, 179, 501, 539, 561, 569, 593, 655  
 Fusion magnets (F), 511
- Gas mixture, 261, 475  
 Gas mixtures, 333  
 Gas mixtures (B), 1  
 Gifford-Mac Mahon, 425  
 Gifford-McMahon, 769  
 G-M refrigerator, 85
- He I, 279  
 He II, 127, 241, 279  
<sup>3</sup>He systems (E), 685  
 Heat capacity, 425  
 Heat exchangers, 469
- Heat transfer, 127, 159, 179, 403, 431, 501, 519, 769  
 High  $T_c$  superconductors, 245, 319  
 High magnetic field, 353  
 High  $T_c$ -superconductors, 137  
 High temperature superconductor, 209  
 Homogeneous current distributions, 729  
 HTSC tapes, 9, 19  
 Hybrid refrigerator system, 67  
 Hydrogen, 279
- Ideal gas line, 173  
 Individual energies, 173  
 Infrared detectors (D), 685  
 Instrumentation, 149, 279, 425  
 Insulating material, 295  
 Insulations, 431  
 Interferometric gravitational wave detector, 61  
 Irradiation, 295  
 Irreversibility, 191
- Joint resistance, 45
- Labyrinth sealing, 75, 85  
 Lead regenerator, 67  
 LED, 341  
 Liquid <sup>3</sup>He, 713  
 Liquid helium, 759  
 Liquid helium temperature, 67  
 Liquid nitrogen, 167
- Magnetic field, 235, 413  
 Magnetic interference, 821  
 Magnetic measurements, 663  
 Magnetometer, 313  
 Magnets, 9, 19  
 Mass streaming, 387  
 Mechanical properties, 117, 155, 319, 417  
 Metals, 417  
 MHD helical-type thruster, 353  
 Microstructure, 693  
 Modified anhydride hardener, 755  
 Molar volume, 365  
 Multifilament wires and tapes, 303

- Multifilament wires and tapes
  - Bi-2223 tapes, 319
- Multilayer, 431
- $\text{Nb}_3\text{Al}$ -based high-field conductor, 345
- Nitrogen (B), 1
- Noisy film boiling, 241
- Orifice pulse tube, 701
- Packed bed, 407
- Partial discharge inception, 167
- Phenomenological thermo-mechanics, 173
- Phonon-rotor model, 365
- Photodetector, 341
- Pipeline, 407
- Pool boiling heat transfer, 713
- Power applications, 303
- Power system stability, 325
- Power transmission systems, 325
- Propagation velocity, 519, 555, 585
- Pulse tube (E), 229
- Pulse tube cryocooler, 475
- Pulse tube refrigeration, 261
- Pulse tube refrigerator, 67, 721
- Pulse tube refrigerators, 379, 387
- Pulse tube, 191, 333
- Quench, 9, 19, 393, 519, 549, 555, 561, 577, 585, 655
- Quench (C), 53, 511, 617
- Rapid heating and quenching, 345
- Reflectance, 61
- Refrigeration, 191
- Refrigerators, 475
- Regenerator, 75, 85
- Regenerators (E), 229
- Residual strength, 789
- Resin properties, 755
- Rotating electric machinery, 117
- Semiconductors, 749
- Silent film boiling, 241
- Simulation, 191
- Sorption coolers (E), 685
- Space cryogenics, 481
- Space cryogenics (F), 229
- Spacecraft engineering, 797
- SQUID, 313, 821
- Stability (C), 53, 617
- Stability, 9, 19, 393, 531, 555, 655, 663
- Stainless steels, 251
- Stirling (E), 1
- Stirling cooler, 821
- Strain effect, 319
- Streaming-driven enthalpy flow loss, 387
- Stress effects, 117, 287
- Structural materials, 117
- Superconducting cable, 445, 555
- Superconducting cables, 45, 179, 501, 539, 549, 593, 637, 655, 663, 729
- Superconducting cables (A), 617, 627
- Superconducting electro-magnetic ship, 353
- Superconducting magnets, 117, 245, 403, 519, 577, 585
- Superconducting magnets (F), 53
- Superconductivity, 821
- Superconductors, 287, 441, 531, 577
- Superconductors (A), 671
- Supercritical helium, 179, 501, 561, 585, 637
- Superfluid helium, 403, 585
- Superfluid helium (He II), 365
- Surface cracks, 789
- Swelling, 295
- Tapered pulse tubes, 379, 387
- Temperature measurement, 241, 441
- Temperature sensor, 413
- Temperature sensors, 235
- Thermal bubble, 167
- Thermal conductivity, 245, 749
- Thermal switch, 769
- Thermodynamic analysis, 701
- Thermodynamics, 191, 261
- Thermodynamics (C), 229
- TIG weld, 251
- Time constant, 445
- Transformers, 325
- Transmission lines, 303
- Transport properties, 149
- Two-component two-phase fluid, 1
- Two-dimensional model, 379, 387
- Two-phase flow, 279, 333
- Two-phase helium flow, 759
- Two-stage 4 K refrigerator, 67
- Ultra-low loss dielectric multi-layer coating mirror, 61
- V-I curves, 29
- Valve, 721
- n-values, 681
- Vapour compression cycle, 1
- Weight loss, 295
- Weir flowmeter, 759
- Welding structure, 251



